

## CLAIMS

What is claimed is:

1 1. A method for transmitting a packet, said packet having a release time and a  
2 tag having a tag value comprising the steps of:

3 adding the tag to a future portion of a data structure based on a  
4 release time, said data structure having a current-tree near the future  
5 portion, said future portion having storage capacity for at least two  
6 tags;

7 removing the tag from an eligible set of tags, including the tag, based  
8 on the tag value; and

9 transmitting the packet on an output link.

1 2. The method of claim 1 wherein the step of removing is preceded by a step of:  
2 selecting an eligible set of tags.

1 3. The method of claim 2 wherein the step of selecting further comprises the  
2 step of selecting at least one post-current tag, including the tag.

1 4. The method of claim 2 wherein the step of selecting further comprises the  
2 step of selecting a tag having a smallest tag value in a post-current tree.

1 5. The method of claim 1 wherein the step of removing the tag is preceded by  
2 the step of:

3 advancing the current-tree, wherein the future portion is based on the  
4 current-tree.

1 6. The method of claim 5 wherein the step of advancing further comprises the  
2 steps of:

3 destroying a old tree at a location T steps from the current-tree and  
4 wherein the data structure has at least  $2 \cdot T$  trees.

1 7. The method of claim 6 wherein the step of destroying further comprises the  
2 step of:

3 reallocating at least one tag of the old tree that has a tag value at least  
4 as large as a smallest tag value of the old tree.

1 8. The method of claim 6 wherein the step of advancing further comprises the  
2 steps of:

3 adding a tag having a smallest tag value of a tree pointed to by  
4 current-tree to an eligible set of tags.

5 9. The method of claim 1 wherein the step of adding further comprises the steps  
6 of:

7 adding the tag to a sub-tree portion of a tree; and  
8 converting the sub-tree to an optimized sub-tree.

1 10. The method of claim 1 wherein the step of removing is preceded by the step  
2 of advancing a current-tree pointer at least one step through the data structure.

1 11. The method of claim 1 wherein the step of removing is preceded by the steps  
2 of:

3 determining if the tag is a smallest tag in a post-current tree; and  
4 adding the tag to a min-tree provided the tag is the smallest tag.

1 12. A method in a router for scheduling a packet having a selected tag said tag  
2 having a tag value, said packet having a release time, comprising the steps of:

3 selecting a selected tree from at least two trees based on the release  
4 time, wherein a first tree has a first time period; and a second tree has  
5 a second time period later than the first time period;

6 storing the selected tag in an order in the selected tree;

7 selecting an eligible set of tags including at least the selected tag; and

8 removing the selected tag from the eligible set of tags, wherein the  
9 eligible set of tags has no smaller tag value.

1 13. The method of claim 12 wherein the step of selecting an eligible set of tags  
2 further comprises the step of:

3 adding the selected tag to a current tree.

1 14. The method of claim 13 wherein the step of selecting an eligible set of tags  
2 further comprises the steps of:

3 advancing the current tree to a tree having at least one tag.

1 15. The method of claim 14 wherein the step of advancing further comprises the  
2 step of removing at least one tag from an old tree.

1 16. The method of claim 12 wherein the step of removing a tag further comprises  
2 the step of transmitting a packet associated with the selected tag.

1 17. The method of claim 12 wherein the step of selecting a tree is preceded by  
2 the step of determining that the release time is smaller than a discard time.

1 18. The method of claim 12 wherein the step of storing further comprises the  
2 steps of:

3 determining if the selected tag is larger than a node in the tree;

4 placing the selected tag in a left sub-tree provided it is determined that  
5 the selected tag is not larger than the node; and

6 placing the selected tag in a right sub-tree provided it is determined  
7 that the selected tag is larger than the node.

1 19. An apparatus for transmitting a packet, said packet having a release time and  
2 a tag having a tag value comprising:

3 a means for adding the tag to a future portion of a data structure  
4 based on a release time, said data structure having a current-tree  
5 near the future portion, said future portion having storage capacity for  
6 at least two tags;

7 a means for removing the tag from an eligible set of tags, including the  
8 tag, based on the tag; and

9 a means for transmitting the packet on an output link.

1 20. The apparatus of claim 19 wherein the apparatus further comprises a means  
2 for selecting an eligible set of tags.

1 21. The apparatus of claim 20 wherein the means for selecting further comprises  
2 a means for selecting at least one post-current tag, including the tag.

1 22. The apparatus of claim 20 wherein the means of selecting further comprises a  
2 means for selecting a tag having a smallest tag value in a post-current tree.

1 23. The apparatus of claim 19 wherein the apparatus further comprises a means  
2 for advancing the current tree, wherein the future portion is based on the current tree.

1 24. The apparatus of claim 23 wherein the means for advancing further  
2 comprises a means for destroying a old tree at a location T steps from the current-  
3 tree and wherein the data structure has at least  $2 \cdot T$  trees.

1 25. The apparatus of claim 24 wherein the means for destroying comprises a  
2 means for reallocating at least one tag of the old tree that has a tag value at least as  
3 large as a smallest-tag value of the old tree.

1 26. The apparatus of claim 24 wherein the means for advancing further  
2 comprises a means for adding tag having a smallest tag value of a tree pointed to by  
3 current-tree to an eligible set of tags.

1 27. The apparatus of claim 18 wherein the means for adding further comprises:

2 a means for adding the tag to a sub-tree portion of a tree; and

3 a means for converting the sub-tree to an optimized sub-tree.

1 30. The apparatus of claim 19 wherein the apparatus further comprises a means  
2 for advancing a current-tree pointer at least one step through the data structure.

1 31. The apparatus of claim 19 wherein the apparatus further comprises:

2 a means for determining if the tag is a smallest tag in a post-current  
3 tree; and

4 a means for adding the tag to a min-tree provided the tag is the  
5 smallest tag.